
New Species of Central American Araceae

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ABSTRACT. Five Central American species of *Dieffenbachia*, *D. beachiana* Croat & Grayum, *D. concinna* Croat & Grayum, *D. grayumiana* Croat, *D. hammelii* Croat & Grayum, and *D. tonduzii* Croat & Grayum, as well as one species of *Rhodospatha*, *R. pellucida* Croat & Grayum, are described as new.

Because of the impending completion of the *Flora de Nicaragua*, five names in *Dieffenbachia* and one in *Rhodospatha* must be published here in order to be included in that work. Revisions of both genera with additional new species (for Central America only for *Dieffenbachia*) are forthcoming.

Dieffenbachia beachiana Croat & Grayum, sp. nov. TYPE: Panama. Bocas del Toro: along road between Chiriquí Grande and Fortuna, 13.2 mi. W of Chiriquí Grande, 8°45'N, 82°10'W, 310 m, *Croat & Grayum 60130* (holotype, MO-3230653; isotypes, K, PMA, US).

Planta terrestris, 40–100 cm; internodia 2–6 cm longa, 1.5–3.5 cm diam.; petiolus 17–46 cm longus, vaginatus 1/4–8/10 longitudinis; vagina decurrens ad apicem; lamina anguste elliptica vel lanceolata, 16–41 cm longa, 6.5–15 cm lata. Inflorescentia 1–3 in quoque axilla; pedunculus 9–13 cm longus; spatha 10–19 cm longa; spadix usque 13–15 cm longus; pistila 48–66.

Slender herb 40–100 cm tall; stems briefly creeping at base; internodes 2–6 × 1.5–3.5 cm, medium green to olive-green, sometimes streaked with cream, semiglossy and obscurely roughened. Leaves clustered toward apex of stem, erect-arching; *petioles* 17–46 cm long (averaging 26.5 cm), broadly C-shaped in cross section, flat with acute, erect margins or sharply to bluntly sulcate adaxially, dark green to brownish, pale-green mottled, matte, usually minutely roughened and with scattered whitish raphide cells visible, drying with scattered clusters of pustular raised areas with granular-puberulent progressions; unsheathed portion (2.5–)10–30 cm long; sheaths decurrent distally, 10–22 cm long (averaging 14.2 cm), comprising 0.25–0.83% of the total length of the petiole (averaging 0.54% of petiole length); *blades* narrowly elliptic to lanceolate, rarely narrowly ovate, 16–41 × 6.5–15 cm, 1.8–5.3 times longer than wide, 0.7–

1.9 times longer than petioles, inequilateral, one side 1–2 cm wider than the other, ± equilaterally acuminate at apex (acumen to 5 mm long), slightly inequilateral and acute, rounded or truncate at base (rarely subcordate in Panama), thinly coriaceous to subcoriaceous, drying papyraceous, usually quilted, weakly bicolorous, crisp-undulate along the margins; upper surface semiglossy (rarely matte), plain dark green (in Costa Rica, but sometimes mottled white or cream in Panama); lower surface slightly paler, semiglossy to weakly glossy or matte below; *midrib* flat-raised, often striate and usually concolorous above, convex or thicker than broad beneath; primary *lateral veins* 23–36 pairs, sunken above, convex beneath, drying paler than surface, departing midrib at an acute angle, then straight to weakly curved to the margin at 70°–110° before sweeping prominently toward apex (to ca. 45° toward apex and sometimes at the very base, sometimes with adjacent veins alternately reflexed and ascending); interprimary veins usually present, not markedly weaker than the primary lateral veins; midrib and primary lateral veins puberulent on lower surface with thick, whitish trichomes; minor veins moderately distinct and weakly raised beneath. Inflorescences 1–3 per axil; peduncles 9–13 cm long; spathe 10–19 cm long, uniformly green; gradually long-tapered to apex, gradually contracted at middle, which corresponds to the sterile section of the spadix; tube 1–2 cm diam. when furled; blade to 3 cm wide when flattened; spadix to 13–15 cm long; staminate portion of spadix 5–6.5 cm long, drying 4 mm diam.; male flowers 1.8–2.6 mm diam., irregularly subrounded, drying smooth and light brown at apex; pistillate portion of spadix 4.5–6 cm long, drying 7 mm diam., usually separated from the staminate portion by a slender, almost completely sterile section 2.0–3.5 cm long, drying 2 mm diam. (the staminate and pistillate portions sometimes almost contiguous); female flowers 48–66, 2–4 situated across the width of the spadix, pistils oblong-ellipsoid, 1.5–2.0 mm long, 1.0–1.6 mm diam.; stigma subglobular, about as broad as the ovary; staminodia narrowly clavate, usually not at all fused at base, ca. twice as long as pistil. Infructescence somewhat flattened, yellow-green

with darker flecking; spathe (10–)14–16 cm long, mottled green and white, eventually turning orange in fruit; fruiting spadix 6–10 cm long; berries orange, subglobose, 6–8 mm diam.

Dieffenbachia beachiana ranges from northeastern Costa Rica to western Panama (Bocas del Toro, Chiriquí, and Veraguas) at elevations of 40–800 m in tropical wet forest, premontane wet forest, and premontane rainforest: In Costa Rica it occurs on the Atlantic slope of the Central Cordillera and the Cordillera Talamanca, ranging from the Sarapiquí region to Tortuguero and Siquirres.

The species is characterized by its moderately thin, quilted blades with many broadly spreading primary lateral veins and crisped-undulate margins with the lower midrib and primary lateral veins puberulent.

Dieffenbachia beachiana is similar to *D. galdamesia* Croat, sp. nov. ined., a species from central Panama that also has somewhat puberulent midribs on the lower blade surfaces. *Dieffenbachia galdamesia* differs in having the pubescence much shorter, merely granular-puberulent, and has fewer than 22 veins per side (vs. 23–36 for *D. beachiana*), which arise from the midrib at a 40°–60° angle. *Dieffenbachia beachiana* is also somewhat similar to *D. grayumiana*, but that species differs in having the veins merely minutely granular in slender rows on drying and in having somewhat more ovate blades.

Dieffenbachia beachiana initiates inflorescences in the late rainy season with plants reaching anthesis in the dry season (January through April). Immature fruits have been seen from April to September, and mature fruits have been seen from July to December.

The species is named in honor of James Beach, who first brought it to my attention while he was a Duke University student at the OTS Field Station at La Selva.

Paratypes. COSTA RICA. **Heredia:** area between Río Peje and Río Sardinalito, Atlantic slope of Volcán Barva, 10°18.5'N, 84°04'W, 480–520 m, *Grayum* 6899 (MO); between Río Peje and Río Sardinalito, Atlantic slope of Volcán Barva, 10°17.5'N, 84°04.5'W, 700–950 m, *Grayum* 6936 (MO); between Río Peje & Río Guácimo, trail from main road across Quebrada Cantarana to Río Guácimo, 250 m, *Grayum & Schatz* 3220 (DUKE); between San José and Pto. Viejo, vicinity of Chilamate, 11.6 mi. N of Cariblanco, 10°27'N, 84°05'W, 100 m, *Croat* 68358 (B, CR, MO); Finca La Selva, near Río Puerto Viejo, ca. 2 km upstream from confluence with Río Sarapiquí, 100 m, 10°06'N, 84°00'W, *Beach* 1448 (DUKE), *Beach* 1485 (DUKE, MO), *Burger & Stolze* 5754 (CR, F), *Hammel* 8122 (DUKE, MO), *Hammel* 8846 (DUKE); Zona Protectora, N slopes of Volcán Barva, between Río Peje and Río Guácimo, 250 m, *Grayum & Schatz* 3220 (DUKE); Sara-

piquí, Finca La Selva, 100 m, *Croat* 44283 (MO). **Limón:** La Colombiana Farm, United Fruit Company, 70 m, *Stanley* 36840 (US); between Río Pacuare and Quebrada Diablo, ca. 2.5 km E of Siquirres, 10°06'N, 83°29'W, 100–200 m, *Grayum et al.* 7698 (MO); Parque Tortuguero Estación Agua Fría, 10°05'N, 83°34'W, 40 m, *Robles* 1234 (CR, MO). **San José:** Vazquez de Coronado, Braulio Carrillo National Park, along San José to Siquirres Hwy., along trail to Río Sucio, site of the Old Carrillo Station, 600–700 m, 10°09'50"N, 83°57'10"W, *Croat* 78771 (INB, MO, WU). **PANAMA. Bocas del Toro:** 10 km SW of Chiriquí Grande, 8°52'N, 82°10'W, 300 m, *Thompson* 4937 (CM); Fortuna Dam–Chiriquí Grande, 7.3 mi. N of bridge over Fortuna Dam, 3.2 mi. N of Continental Divide, 8°45'N, 82°15'W, 700 m, *Croat & Grayum* 60255 (MO); Fortuna–Chiriquí Grande Road, vic. of continental divide, 10 road-miles from continental divide and about 2 road-miles along road E of hwy., 08°55'4"N, 82°10'4"W, 300 m, *McPherson* 11816 (MO), *McPherson & Aranda* 10095 (MO); Fortuna–Chiriquí Grande, 7.7 mi. W of Chiriquí Grande, 1.5 mi. W of Punta Peña, 8°50'N, 8°10'W, 80 m, *Croat & Grayum* 60094 (MO). **CULTIVATED:** Origin Costa Rica, *Henny* 5 (MO).

***Dieffenbachia concinna* Croat & Grayum, sp. nov.** TYPE: Costa Rica. Puntarenas: along road between Palmar Norte and Panamanian border 3 km N of jct. to Rincón, 8°48'39"N, 83°16'18"W, 110 m., 10 Sep. 1996, *Croat & Hannon* 79191 (holotype, MO-05096177; isotypes, AAU, B, CAS, COL, CR, DUKE, F, GH, HUA, IMB, K, M, MEXU, NY, PMA, US).

Planta terrestris, 0.6–1.3 m; internodia 1.5–4.0(–7.5) cm longa, 1–4 cm diam.; petiolus 7.5–25(–35) cm longus, vaginatus 2/5–fere omnino; vagina 6.7–13(–20) cm longa; lamina elliptica, ovata-elliptica, raro ovata aut late lanceolata, 16–36 cm longa, (7.8–)10–15.5(–20.5) cm lata; nervis primariis lateralibus 6–12(–14) utroque; inflorescentia 2–8 in quoque axilla; pedunculus (2.5–)8–17.5 cm longus; spatha 11–25.7 cm longa; spadix 12–14 cm longus; pistila 42–65.

Small erect herb, 0.6–1.3 m tall; sap milky, typically lacking foul odor; internodes 1.5–4.0(–7.5) cm long, 1–4 cm diam., medium green to dark green, obscurely marbled with light to medium green, glossy; *petioles* 7.5–25(–35) cm long (averaging 17 cm long), moderately erect, semiglossy or almost matte, dark green to olive-green, blotched-striate or streaked with whitish or silver-green, drying greenish to sometimes light yellow-brown, sheathed from lower 2/5 to nearly throughout (averaging 0.63 the length of the petiole); sheath 6.7–13(–20) cm long (averaging 9.5 cm long), to 1.5 cm high, the margins erect to involute, asymmetrically auriculate to rounded and free-ending at apex, one side obtuse to rounded, the other acute to obtuse, the unsheathed portion 1–13 cm long, often solid green or whitish, terete and obtusely sulcate near the apex or subterete to C- or D-shaped, flat to

shallowly sulcate, the lateral margins rounded or sometimes acute; leaves erect-arching; *blades* usually \pm elliptic, ovate-elliptic, rarely ovate or broadly lanceolate, 16–36 cm long, (7.8–)10–15.5(–20.5) cm wide (averaging 23×12 cm), usually broadest at or near the middle, 1.46–2.9 times longer than wide (averaging 2 times longer than wide), 0.8–2.4 times longer than the petiole, equilateral to slightly inequilateral (one side sometimes to 1.0 cm wider than the other), equilaterally acuminate at apex (the tip sometimes apiculate), broadly acute or usually rounded at base, slightly inequilateral, moderately coriaceous, weakly to moderately bicolorous, *upper surface* solid dark green or rarely whitish to cream or yellow-green-splotched or -flecked, semiglossy to glossy, drying dark olive-green, dark gray-green to yellowish brown above, *lower surface* moderately paler and matte to weakly glossy, drying yellowish brown to greenish, rarely dark gray-green; *midrib* flat to broadly flattened-convex and concolorous to paler above, sometimes pale in distal 1/3, low-convex to convex or rounded-triangular and paler to slightly paler below, drying light brown to dark brown but with the medial portion usually drying even darker; primary *lateral veins* 6–12(–14) per side, spreading at 45° – 70° angle, sometimes arising at an acute angle, then spreading, only rarely at a different angle on opposite sides of the blade, weakly sunken above, convex to obscurely raised below, drying moderately inconspicuous and scarcely raised, yellow-brown, paler than or darker than surface, mostly concentrated in the lower 1/2; interprimary veins sometimes present, never more than 1 per pair of primary lateral veins, usually much less evident than the primaries; minor veins inconspicuous to visible and darker than surface. *Inflorescences* 2–8 per axil; peduncles (2.5–)8–17.5 cm long (averaging 10.5 cm long), somewhat dorsiventrally compressed, drying 3–4 mm diam.; *spathe* 11–25.7 cm long, 1.5–2.0 cm diam. when furled, constricted ca. 4.5 cm above the base, 4.5–8.5 cm wide on tube when flattened, 1.8–3 cm wide at constricted area when flattened, to 3.3 cm wide on blade when flattened, as long as or up to twice as long as the peduncle (averaging 1.6 times longer), medium to pale green outside, somewhat darker on tube except whitish on open face, uniformly paler within, drying dark brown to blackened; *spadix* 12–14 cm long, to 2 cm shorter than spathe, the free portion 6.5–9.5 cm long, protruding somewhat forward at anthesis; stipe and spadix axis pale green; pistillate spadix 4.5–9 cm long, 5–12 mm diam., narrowed slightly toward the apex; staminate portion of spadix white, 8–9 cm long, 7–10 mm diam., tapered slightly toward both ends; sterile sta-

minate portion 2.5–4 cm long, 5–7 mm diam., mostly bare but with a scattering of staminodia at both ends (especially at base); fertile staminate portion of spadix 3.5–6.5 cm long, 7 mm diam., broadest at middle, tapered toward both ends; the flowers irregularly rounded, 0.8–1.4 mm diam.; female flowers 42–65, pistils globose, pale green, 1.0–2.5 mm diam., relatively closely spaced; stigmas pale yellow; staminodia 1–5 mm long, up to 3 times longer than the pistils, slender, somewhat flattened and free from one another at base, tapering and somewhat globular at apex, the tips to 1–2 mm diam. Infructescence with spathe yellow-orange to bright orange; spadix to 6 cm long; berries oblong-elliptic, bright red to orange-red, ca. 1 cm long, 8 mm diam.

Dieffenbachia concinna ranges from southeastern Nicaragua along the entire Atlantic slope and the Osa Peninsula of Costa Rica from sea level to 200 m, mostly at less than 100 m, sometimes locally common in rocky sites along streams. The species occurs in tropical wet forest and premontane wet forest.

The species is recognized by having all parts of the plant appearing glossy (on live plants), as well as by its relatively small stature, moderately coriaceous, more or less elliptic, weakly inequilateral blades, and auriculate petiolar sheath. It is most easily confused with *D. oerstedii* but differs from that species in its generally somewhat larger size, and more coriaceous blades typically broadest at the middle (vs. broadest below the middle in *D. oerstedii*) with more numerous primary lateral veins (9–14 vs. 4–11 for *D. oerstedii*). In addition, the blades of *D. concinna* are glossy above and at most rounded at the base, whereas they are typically weakly glossy to matte and frequently subcordate in *D. oerstedii*.

Flowering occurs mostly during the middle of the rainy season, from July through October, especially August and September, but may occur as early as March. A cultivated collection at the Missouri Botanical Garden flowered repeatedly over a two-week period during late May and early June. Collections with immature fruits have been seen from December to March. Mature fruits occur primarily from May through September, especially May to July, but have been seen as early as March.

Grayum et al. 10588, from the headwaters of the Río Piedras Blancas in Puntarenas Province, is unusual not only in occurring much higher (to 900 m) than most collections of this species but also in having a broader leaf (to 19 cm wide) with a longer petiole (to 30 cm). In other respects it agrees with other collections of *D. concinna*.

Paratypes. COSTA RICA. **Heredia:** near Puerto Viejo along road near Río Sucio, 20 m, *Croat 35702* (MO); Finca La Selva, OTS Field Station on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, 50–200 m, *Croat 78732* (INB, MO), *Grayum 2840* (DUKE), *Hammel 8784* (DUKE, MO), *Hammel 9688* (DUKE), *Hammel 9772* (DUKE), *Hammel 10081* (DUKE); near Puerto Viejo along road near Río Sucio, 20 m, *Croat 35688* (MO). **Limón:** La Colombiana Farm of the United Fruit Co., 70 m, *Standley 36739* (US); headwaters of Quebrada Mata de Limón, westernmost fork, Finca Anai (Sixaola region), 09°34'N, 82°39'W, 20–25 m, *Grayum et al. 4447* (MO); Parque Nacional Tortuguero, Cerro Tortuguero, 1–119 m, 10°35'N, 83°31'W, *Barringer et al. 1973* (F); Cerro Tortuguero junto a la Barra de Tortuguero, 10°35'N, 83°32'W, 60 m, *Robles 2090* (CR, INB, MO); Cerro Tortuguero, 119 m, *Gomez-Laurito 7856* (CR); Ref. Nac. Barra del Colorado, Río Chirripocito–Río Sardina, Ref. Nac. Barra del Colorado (“Sardinal” on Chirripo Atlántico quadrangle), 12 m, 10°38'N, 83°45'W, *Grayum 9777* (CR, MO); Río Reventazón, Finca Montecristo below Cairo, 25 m, *Standley & Valerio 48960* (US); Tortuguero National Park, near Boca de las Lagunas de Tortuguero, 10°34'N, 83°32'W, 0–30 m, *Burger & Antonio 11249* (F, MO); Cantón de Pococí, Refugio de Vida Silvestre Barra del Colorado, SE base of Cerro del Tortuguero, 10°35'N, 83°31'30"W, ca. 0–60 m, *Grayum et al. 11139* (CM, CR, INB, MO, USJ). **Puntarenas:** near Esquinas, along Panamerican Hwy., *McAlpin 85–33* (SEL); Orotina–Jacó, valley of Río Grande de Táracoles, 1 km S of Quebrada Ganado, 5 km S of bridge over Río Agujas on road to Jacó, 09°42'50"N, 84°36'30"W, 50 m, *Croat 79076* (INB, MO); Río Sándalo, 1–10 m, *Dodge & Goerger 10198* (F, MO), *Dodge & Goerger 10020* (F, MO); Cantón de Osa, Fila Costeña, Fila Cruces, headwaters of Río Piedras Blancas, Cerro Anguciana, 08°49'02"N, 83°11'25"W, 900–1000 m, *Grayum et al. 10588* (MO); Cantón de Osa, Fila Huacas, ca. 4 km NE of Panamerican Hwy. at Las Huacas (Venecia) along road to Sinaí, 08°52'00"N, 83°17'00"W, 400–500 m, *Grayum & Evans 10156* (MO); Río Riyito (valley of Laguna Chocuaco) and Quebrada Banegas, S of Cerro Rancho Quemado (ca. 7 km W of Rincón de Osa), 8°41'N, 83°32.5'W, 200–300 m, *Grayum et al. 7567* (MO); Rincón–Puerto Jiménez, 40 km W of Panamerican Hwy., 100 m, *Gómez 19531* (MO); near airport, 4 mi. W of Rincón de Osa, *Raven 21532* (F); along road from Panamerican Highway to Rincón, 10 km W of Interamerican Hwy., 08°45'08"N, 83°18'W, 200 m, *Croat & Hannon 79167* (MO); Rincón–Rancho Quemado, just S of Rincón near Río Rincón, 08°41'21"N, 83°29'00"W, *Croat & Hannon 79170* (HUA, IMB, MEXU, MO, QCA, RSA, WU); Rincón–Rancho Quemado, ca. 10 km W of main Rincón–Pto. Jimenez Road, 8°32'30"N, 83°32'W, 150–260, *Croat & Grayum 59785* (CR, MO); Palmar Norte vicinity, 30 m, *Allen 5669* (EAP, US); hills above Palmar Norte, 100–200 m, *Croat 35108* (MO); Quebrada Benjamín near crossing of trail from Palmar Norte to Jalisco, 8°58'00"N, 83°28'00"W, 160 m, *Grayum et al. 9962* (MO); Osa Peninsula, *Nicolson 3393* (US); 6 km W of Rincón, *Grant & Rundell 92–01928* (CR, MO, US); 4 mi. W of Rincón de Osa, 8°42'N, 83°31'W, *Burger & Stolze 5461* (CR, F); Rincón de Osa, ridge between Quebrada Aparicio and Q. Aguabuena, 200–400 m, 8°42'N, 83°31'W, *Grayum et al. 3982* (CR, MO), *3983* (CR, MO); ca. 5 km W of Rincón de Osa, 8°42'N, 83°31'W, 50–200 m, *Burger & Liesner 7196* (CR, F, PMA); vic. of Boscosa, at Quebrada Agua- buena, 50 m, 08°42'01"N, 83°30'48"W, *Croat & Hannon*

79238 (COL, IMB, MO, PMA, EFH, TEX); Parque Nacional, Sector Esquinas, vicinity of Fila Gamba, hills behind Esquinas Rain Forest Lodge, along Quebrada Negra, at end of side road off of Villa Briceño to Golfito Road, 08°42'00"N, 83°12'30"W, 200–300 m, *Croat & Hannon 79291* (CM, DUKE, INB, MO, P, WU); Golfito–Villa Briceño Road, Río Cañaza, 08°39'30"N, 83°12'W, 80 m, *Grayum 9250* (MO); along shortcut road from Villa Briceño on Panama Hwy., W side of Villa Briceño, ca. 6 km from Golfito airport, less than 100 m, 8°41'30"N, 83°12'W, *Croat & Grayum 59930* (CM, K, MO); Golfito, Refugio de Vida Silvestre, 08°39'50"N, 83°10'40"W, 30–100 m, *Martén 789* (F); along highway to Golfito from Panamerican Highway at Río Claro, 2.5 mi. SE of Golfito, 8°36'N, 83°04'W, 60 m elev., *Croat & Hannon 67594* (AAU, CM, DUKE, F, JAUM, MO, MY, NY, P, QCNE, SA, SCZ, SEL, TEFH, VEN, US, W); Parque Nacional Corcovado, Lower Lookout Trail, 08°27–30'N, 83°33–38'W, 10–50 m, *Kernan 748* (CR); Monkey Woods, *Kernan & Phillips 831* (CR); Estación Sirena, S of Río Sirena along Río Camaronal, sea level, 08°28'N, 83°55'W, *Knapp 2165* (MO); Estación Sirena, 8°28'N, 83°35'W, 1–20 m, *Fco. Quesada 51* (MO); up to 1 km W of Sirena, 8°29'N, 83°36'W, *Liesner 2871* (CR, MO); Equinas Forest, 25 km SE of Palmar Sur, along Pan-Am Hwy., *Croat 78318* (MO); Interamerican Hwy., km 287, 2 km NW of Chacarita, 30 km S of Palmar Sur, 8°48'N, 83°17'W, 20–40 m, *Grayum & Fleming 8119* (MO); Cantón Coto Brus, Guaymí Indian Reservation, Río Limoncito near junction of Villa Palacios school trail, 680 m, *Koshear 59* (CR). NICARAGUA. **Río San Juan:** Reserva Indio-Maíz, 10°45'N, 083°59'W, *Rueda et al. 4070* (MO?).

***Dieffenbachia grayumiana* Croat, sp. nov. TYPE:**

Costa Rica. Limón: Refugio Nacional Barra del Colorado, forests and pastures between Río Chirripocito and Río Sardina (“Sardinal” on Chirripó Atlántico Quadrangle), 10°38'N, 83°45'W, 12 m elev., *Grayum 9773* (holotype, MO-4370212; isotype, INB).

Herba, 1–1.5 m; internodia 2.5–3.0 cm longa, 2–3.5(–10) cm diam.; petiolus subteres, (24–)30–59 cm longus, vaginatus 0.3–0.55 longitudinis; vagina decurrens ad apicem; lamina anguste ovata (22–)30–54 cm longa, 10–32 cm lata; nervis primariis lateralibus 13–18(–22); inflorescentia 1–3 in quoque axilla; pedunculus 8–12 cm longus; spatha 16.5–23.5 cm longa; spadix 15–27 cm longus; pistilla 125–160.

Stout herb, 1–1.5 m tall; stems erect at apical part, the older portion reclining for up to 1.5 m; internodes 2.5–3.0 × 2–3.5(–10) cm, dark green, glossy, variegated with cream-yellow or pale green (sometimes medium green with dark green lines as in *Croat & Grayum 60149*); petioles (24–)30–59 cm long, sheathed from 0.3–0.55 their length, matte, dark olive-green to deep brown, streaked or with cream-white in lower half, especially near the base, subterete, weakly flattened on upper surface toward the apex, sometimes slightly whitish adaxially and continuing whitish onto lower midrib; sheath 19–29 cm long, usually decurrent at apex, sometimes

weakly free-ending (as in *Croat & Grayum 60149*); *blades* narrowly ovate to oblong-ovate, (22–)30–54 × 10–32 cm, 1.5–2.6 times longer than wide, ranging from 0.6 as long as petioles to 1.4 times longer than petioles but averaging about as long as petioles, slightly inequilateral (one side 1–1.5 cm wider than the other), acuminate to abruptly acuminate at apex, inequilaterally subcordate (sinus to 2.5 cm deep) or rarely inequilaterally rounded at base (sometimes one side weakly subcordate, the other side rounded), subcoriaceous, drying thin and dark olive-green above, slightly concolorous to slightly bicolorous; *upper surface* usually glossy to semiglossy, dark green, drying dark olive-green, plain (unvariegated) to usually conspicuously mottled yellow-cream; *lower surface* semiglossy to nearly matte, slightly paler, plain to more weakly mottled cream drying yellowish green; *midrib* flat to weakly flat-raised or broadly convex (sometimes broadly sunken at base, broadly flat-raised and striate toward apex) slightly paler and dark-green-spotted to concolorous above, convex to narrowly rounded and whitish or narrowly acute and paler below; *primary lateral veins* 13–18(–22) per side, gradually arising at a steep angle from the midrib, then spreading in a broad curve at a 55°–80° angle (those near the apex to 25° angle, those near the base sometimes 90°–110° angle and sometimes forming a sigmoid curve), deeply sunken above, convex below, forming a series of weakly developed collective veins that eventually merge with the margin; at least the midrib sometimes minutely farinose-granular; *minor veins* moderately obscure below. *Inflorescence* 1–3 per axil, sometimes subtended by a reduced leaf with a fully sheathed petiole (the sheath emarginate at apex) and a reduced leaf blade 12–15 cm long, 3.5–6.5 cm wide; *peduncle* 8–12 cm long, drying 2–3 mm diam.; *spathe* 16.5–23.5 cm long, 3–4 cm longer than the spadix, 4.0–5.0 cm wide at base, to 2.5–3.5 cm wide at constriction, 2.5–3 cm wide on blade, up to 7 cm wide when flattened, uniformly light green to medium green on both surfaces, weakly glossy throughout outside, somewhat glossier within; *spadix* 15–27 cm long; *pistillate portion* 8.0–9.3 cm long, drying 7–10 mm wide; *staminate portion* 5–6.5 cm long, white, tapered toward apex and slightly toward the base; the staminate and pistillate portions separated by an almost sterile segment 2–2.5 cm long with a few scattered pistils in the lower half and a few scattered staminodia in the upper half; *male flowers* 1.2–1.6 mm diam., irregularly angled with rounded margins; *female flowers* ca. 125–160, pistils densely aggregated, separated from one another by 1/2 to 2.5 times their width, irregularly scattered with

roughly 4–5 covering the width of the spadix, pale lemon-yellow, depressed-globose, 1.8–2 mm wide; *staminodes* white, 3–5 per pistil, free or briefly united at base, 1.5–2.2 mm long. *Infructescence* to 27 cm long, with fruiting portion 10–14 cm long; *berries* red-orange, subglobose, ovoid to ellipsoid, 5–7 mm diam.

Dieffenbachia grayumiana ranges along the Atlantic slope from northwestern Costa Rica to western Panama (then disjunct to northern Colombia), mostly near sea level but ranging up to 1300 m in Costa Rica in Alajuela Province (vicinity of Monteverde Reserve) and to 480 m in Heredia Province. It occurs in areas of tropical wet forest, premontane wet forest, and premontane rainforest. Grayum (pers. comm.) reported the species to occur mostly in light gaps and disturbed areas in primary forest at the La Selva Reserve in Costa Rica.

The species is characterized by its narrowly ovate, typically subcordate, mottled blades, weakly sheathed, decurrent petioles, and variegated stems and petioles. Also characteristic are blades that are frequently glossy on the upper surface and matte or nearly so on the lower surface. The major veins are sometimes minutely farinose-granular on the lower surface. In this regard it is perhaps related to *D. beachiana*, a species with puberulent major veins on the lower blade surface. Aside from pubescence type, *Dieffenbachia beachiana* also differs in having much narrower blades (1.8–5.3 times longer than wide) with 23–36 pairs of primary lateral veins.

A collection from Bocas del Toro Province in Panama (*Croat 74945*) differs in having larger concolorous blades (54 × 30 cm), which are only weakly glossy on the upper surface, with weakly sunken primary lateral veins. Another collection from Bocas del Toro, *Croat & Grayum 60149*, had stems to approximately 10 cm in diameter, substantially larger than those of any other collection reported.

Paratypes. COLOMBIA. **Chocó:** ca. 10–15 km S of Quibdó on road to Istmina (Panamerican Hwy.), and 8–10 km E on road to petroleum exploration camp, 5°35'N, 76°37'W, 90 m, *Grayum et al. 7657* (MO); Río Nercua, Quebrada Barrial–Quebrada Ambrosio, near Camp Curiche, *Duke 11471* (NY, OS); Río Truandó, *Schott 6* (NY). COSTA RICA. **Alajuela:** Upala Road, 5 km S of Canalete, near Río Zapote, 10°48'N, 85°02'W, 100–200 m, *Burger & Baker 9968* (CR, F); Monteverde Reserve, 1300–1400 m, *Dryer 1681* (F); Monteverde, upper Río Peñas Blancas, 9°17'N, 84°86'W, 1250–1350 m, *Burger et al. 10734* (CR, F). **Heredia:** Volcán Barva, area between Río Peje & Río Sardinalito, 10°18'30"N, 84°04'W, 480–520 m, *Grayum 6887* (MO); Río Sarapiquí, jenseits von La Virgen, 200–250 m, 1974, *Cl. Horich s.n.* (M); San José–Puerto Viejo,

vic. Chilamate, 11.6 mi. N of Cariblanco, 10°27'N, 84°05'W, 100 m, *Croat* 68359 (B, MO); La Selva Biological Station, 10°26'00"N, 84°01'00"W, 50–150 m, *Beach* 1440 (DUKE), *Beach* 1441 (DUKE), *Burger & Matta* 4181 (CR, F), *Croat* 44226 (MO), *Croat* 44321 (MO), *Croat* 78733 (INB, MO), *Folsom* 9724 (MO), *Grayum* 2288 (DUKE), *Hammel* 8167 (DUKE), *Hammel* 8617 (DUKE), *Hammel* 8835 (DUKE), *Hammel* 8873 (DUKE), *D. Smith* 597 (DUKE); N slopes of Volcán Barva, between Río Peje & Río Guácimo, *Grayum & Schatz* 3206 (DUKE), *I Chacón* 507 (DUKE, MO); Secondino's Woods, off Occidental, *Kress* 84-1632 (SEL). **Limón:** Refugio Gandoca-Manzanillo, along Río Gandoca, 9°35'N, 82°36'W, 0–5 m, *Grayum et al.* 8038 (MO); Guápiles–Guácimo, vic. Guácimo, 10°12'N, 83°43'W, 400 m, *Barringer* 2432 (F); Cerro Coronel, E of Laguna Danto, 10°41'N, 83°38'W, 20–170 m, *Stevens* 23642 (CR, MEXU, MO); Refugio Nacional Barra del Colorado, between Río Chirripocito & Río Sardina, 10°38'N, 83°45'W, 12 m, *Grayum* 9830 (MO); Pococí Cantón, Parque Nacional Tortuguero, along Río Suerte between Palacios & Caño Penitencia, 10°33'N, 83°33–35'W, 10 m, *Grayum et al.* 11116 (INB, MO), 10°29'N, 83°31'W, 8–25 m, *Grayum et al.* 11163 (IMB, MO). **Puntarenas:** Río Piedras Blancas, Cerro Anguciana, 08°49'02"N, 83°11'25"W, 900–1000 m, *Grayum* 10588 (CR, INB, MO). **PANAMA. Bocas del Toro:** W of Chiriquí Grande, < 50 m, *M. Akers* 78A (MO); Gualaca–Chiriquí Grande, 1.4 mi. S of Punta Peña, 0°55'N, 82°11'W, 200 m, *Croat* 74945 (MO); Chiriquí Grande–Fortuna, 3 mi. W of Chiriquí Grande, 8°47'N, 82°09'W, ca. 10 m, *Croat & Grayum* 60149 (MO); along railroad between Almirante and Chanquinola, Station Milla 5, 50 m, *Croat & Porter* 16499 (MO).

Dieffenbachia hammelii Croat & Grayum, sp. nov. TYPE: Costa Rica. Heredia: Finca La Selva, the O.T.S. Field Station on the Río Sarapiquí, 50–80 m elev., *Grayum* 7670 (holotype, MO-3491533; isotypes, B, CR, K).

Herba plerumque 25–40 cm raro usque 70 cm alta; internodia 3.5–7.5 cm longa, 0.5–2.0 cm diam.; petiolus 7–25(–35) cm longus, anguste C-formatus, non profunde sulcatus adaxialiter; lamina elliptica aut oblanceolata; costa plana et elevata adaxialiter; nervis primariis lateralibus 9–17 utroque; inflorescentia 1–3 in quoque axilla; pedunculus 4.5–11 cm longus; spathe (8–)10–12.5 cm longa. Baccae aurantiacae.

Small herb, mostly 25–40 cm (rarely to 70 cm tall); sap not foul-smelling; stem becoming decumbent and subrhizomatous at base; *internodes* 1–1.5 cm long on lower portions, 3.5–7.5 cm long toward apex, 0.5–2.0 cm diam., glossy, drying yellowish brown to gray-green, weakly striate; *petioles* 7–25(–35) cm long (averaging 15 cm long), sheathed (0.3–)0.4–0.8 their length, plain green or mottled with dull yellow-green, drying matte, greenish or sometimes to yellowish brown, erect; sheath 5.5–13 cm long, narrowly decurrent at apex and sometimes difficult to discern where it ends; unsheathed portion 1–9 cm long (rarely to 15 cm), narrowly C-shaped to D-shaped, shallowly sulcate adaxially,

the margins finely acute; *blades* erect-arching, narrowly to broadly elliptic or oblanceolate, slightly inequilateral (one side 0.5–1.0 wider) (the narrower side usually plane, the wider side usually minutely undulate), 9–28 × 3.2–13(–15) cm, 1.7–3.4 times longer than wide (averaging 2.7 times longer than wide), acuminate at apex, narrowly to broadly acute or attenuate and equilateral or slightly inequilateral at base, rarely obtuse, thinly coriaceous, slightly to moderately bicolorous; *upper surface* plain medium green to dark green and weakly glossy to semiglossy, drying light yellow green to dark brown; *lower surface* slightly to moderately paler, weakly glossy to essentially matte, drying usually yellow-green, sometimes yellow-brown; *midrib* flat-raised or rarely convex (sometimes obscurely sulcate medially) and slightly paler above, convex to narrowly convex below, 1–3 mm diam., drying pale brown, matte, with short, white raphide cells; primary *lateral veins* 9–17 per side, moderately obscure, arising at 40°–50° angle, weakly curved to the margins, weakly sunken or slightly raised in weak valleys, weakly quilted and concolorous above, convex and weakly pleated-raised below, moderately inconspicuous on drying, slightly darker or slightly paler than surface; interprimaries about as conspicuous as the primary lateral veins; minor veins and crossveins clearly visible, and darker than lower surface, moderately faint on drying. Inflorescences 1–3 per axil; peduncles 4.5–11 cm long, subterete; *spathe* (8–)10–12.5 × 1.2–1.5 cm, to 3 cm wide when flattened, 1.4–2.7 times longer than peduncle, long-attenuate above tube, cuspidate to acuminate at apex, uniformly medium-green outside and inside; *spadix* 6.5–12.5 cm long; staminate portion moderately acute at apex, tapered to both ends, (1.7–)3–4.5 cm × 6–7 mm (dried); male flowers bluntly 4–5-sided, irregularly shaped toward the base, more nearly rounded toward the apex, 2–2.5 mm diam.; pistillate spadix 5–8.5 cm long (fused with spathe for up to 4 cm), 6–7 mm wide; female flowers 26–31, sparse, separated from the staminate portion by a sterile section (0.8–)2.0–3 cm long, this with only a few scattered sterile male flowers; pistils ovoid, loosely scattered in clusters of 2–4 with up to three across the width of spadix but often with spaces between the groups of pistils up to twice the width of the spadix; staminodia up to twice as long as pistils, free from one another at base and drying flattened and very thin. Infructescence with spathe pale orange, to 22 cm long; berries orange to bright red, oblong-ellipsoid, ca. 1 cm long, 8 mm diam.

Southeastern Nicaragua (Depto. Río San Juan)

and northern Costa Rica from sea level to 100 m in the tropical wet forest life zone, in wet forests and swampy areas on the Atlantic slope.

The species is characterized by its small stature, glossy, decumbent, subrhizomatous stems, weakly sheathed, matte-drying petiole (decurrent at apex), and moderately small, more or less oblong-elliptic, weakly inequilateral plain green leaf blades with moderately numerous primary lateral veins, and with one blade margin plane and one minutely undulate.

In Costa Rica *Dieffenbachia hammelii* is most easily confused with *D. oerstedii* or smaller plants of *D. grayumiana*, both of which can be distinguished in having the petiolar sheath auriculate at the apex rather than decurrent as in *D. hammelii*. At La Selva, where the species was first studied, *D. hammelii* is uncommon. One collection (Hammel 8784) reported that the sap was not foul-smelling, although many species in the genus are.

Flowering plants have been seen from March through May while mature fruits have been seen in September. Cultivated plants at the Missouri Botanical Garden flowered in mid July and mid October.

Paratypes. COSTA RICA. **Heredia:** La Selva Biological Station, 10°26'N, 84°01'W, 50–200 m, *I. Chacón* 553 (F), *Croat* 78731 (INB, MO), *Folsom* 9329 (DUKE), *Grayum* 2772 (DUKE, MO), *Hammel* 8212 (DUKE), *Hammel* 8273 (DUKE), *Hammel* 8748 (DUKE, F, MO), *Hammel* 12320 (MO). **Limón:** Cerro Coronel, E of Río Zapote, within 1 km of Río Colorado, 10°40'N, 83°40'W, 10–40 m, *Stevens et al.* 24699 (CR, MO), *Stevens* 24257 (CR, MO); 2–3.5 airline km SSE of Islas Buena Vista in the Río Colorado, 14–16 airline km SW of Barra del Colorado, 10°40'N, 83°40'W, 10–120 m, *Davidse & Herrera* 31077 (CR, MO), *Davidse & Herrera* 31213 (MO); Refugio Barra del Colorado, Río Chirripocito–Río Sardina (“Sardinal” on Chirripo Atlantico quadrangle), 10°38'N, 83°45'W, 12 m, *Grayum et al.* 9744 (CR, MO); Tortuguero National Park, near Boca de las Lagunas de Tortuguero, 10°04'N, 83°32'W, 0–30 m, *Burger & Antonio* 11224 (F); Cantón de Pococí, Parque Nacional Tortuguero, northern terminus of Lomas de Sierpe, S from Río Tortuguero, 10.29N, 83.31.30W, ca. 8–25 m, *Grayum et al.* 11169 (CR, INB, MO). **San José:** Vázquez de Coronado, 600–700 m, Braulio Carrillo National Park, San José–Siquirres Hwy., trail to Río Sucio, site of the Old Carrillo Station, 10°09'50"N, 83°57'10"W, *Croat* 78758 (INB, MO, WU). NICARAGUA. **Río San Juan:** near Caño Chontaleno, 20 km NE of El Castillo, 200 m, *Neill & Vincelli* 3484 (MO).

Dieffenbachia tonduzii Croat & Grayum, sp. nov.

TYPE: Panama. Bocas del Toro: vic. Valle de Silencio, along Río Changuinola, ca. 1 km above mouth of Río Teribe, vic. Teribe Indian population, disturbed forest among cacao plantations, 9°21'45"N, 82°31'45"W, <100 m, 25 June 1994, *Croat & Zhu* 76452 (holotype, MO-04611212; isotypes, AAU, B, CAS, COL, CR, DUKE, F, GH, HUA, IMB, K, M, MEXU, NY, PMA, SCZ, US, VEN, WU).

Herba 0.5–1.5 m alta; internodia 1.5–4.5(–6) cm longa, 1.5–3(–4.5) cm diam.; petiolus 10–24 cm longus, vaginatus ubique, vagina rotundata inaequaliter apice, saepe imbricata laminae basi; lamina inaequilatera, ovata vel ovato-elliptica aut oblanceolato-elliptica, (15–)25–48(–63) cm longa, (8–)15–32 cm lata, basi plerumque inaequaliter subcordata. Inflorescentia 1–4, pedunculus (1–)6–17 cm longus, usque ad 6 cm diam. (in sicco); spatha viridis, cum tubo 2–2.5 cm diam. (in sicco); spadix pistillatus 8.5–9.5 cm longus; cum parte pistillata aggregata praeter summum 1–1.5 cm.

Terrestrial herb 0.5–1.5 m tall, usually to less than 1 m tall; internodes usually solid dark to medium green, sometimes faintly marbled with gray-green or yellowish gray throughout (on plants that also have streaked petioles), initially weakly glossy, becoming semiglossy to glossy, often with a subvelvety sheen, 1.5–4.5(–6) cm long, 1.5–3(–4.5) cm diam., the petiole scars manila to whitish, curved downward on the opposite side of the stem and ending unevenly; *petioles* 10–24 cm long (averaging 17.6 cm long), held ± erect, medium green (except sometimes white to pale green at base), almost matte to weakly glossy, weakly striate (especially near the base), narrowly rounded to obtusely angular on abaxial surface and often whitish medially, sometimes streaked in a variegated pattern throughout (this whitish coloration continuing onto the midrib), sheathed virtually throughout; sheath erect to involute (rolled inward throughout in age), free-ending and unequally rounded at apex, prolonged to 2 cm beyond the base of blade; un-sheathed part obsolete or rarely to 1 cm long (when evident obtusely flattened); *blades* inequilateral (one side 1–3.0 cm wider), ovate to ovate-elliptic or oblanceolate-elliptic, (15–)25–48(–63) cm long, (8–)15–32 cm wide, (averaging 34 × 16 cm), broadest near the middle, sometimes below, frequently above the middle, 1.4–2.5(–3.5) times longer than wide (averaging 2.1 times longer than wide), 1.9–3 times longer than petioles, spreading to erect-spreading, gradually to abruptly acuminate, sometimes acute at apex, inequilaterally cordulate at base, one side sometimes broadly rounded to obtuse, the other side cordulate, sometimes inequilaterally acute, subcoriaceous, often conspicuously quilted, moderately bicolorous; *upper surface* usually solid dark to medium green, sometimes conspicuously to sparsely variegated with pale green or pale yellow throughout much of the surface, the mottling large or small, but somewhat restricted to the area midway between the midrib and margin, matte to weakly glossy, sometimes appearing weakly velvety, drying gray-green to olive-green or dark brown; *lower surface* much paler and matte to weakly glossy, silvery-green, drying yellowish green to

yellow-brown below; *midrib* flat to broadly rounded and moderately to strongly paler, pale green or sometimes creamy white above (sometimes only toward the apex), bluntly acute to obtusely angular and paler, sometimes whitish or creamy white below, (0.6–)1–1.7 cm wide; primary *lateral veins* (14–)18–25(–30) per side, arising at an acute angle with the midrib and spreading at 45°–90°, sometimes reflexed toward the base, prominently to weakly and obtusely sunken above, convex to weakly raised and darker than surface or concolorous below, some of the lowermost with a weak fold near the base (*Croat & Grayum 60112*), sometimes convex-pleated below; interprimary veins almost as conspicuous as the primaries; minor veins moderately to distinctly visible, darker than surface below. Inflorescences 1–2(–4) per axil, often with two oriented in opposite directions; *peduncle* (1–)6–17 cm long (averaging 10.3 cm long), 7–8 mm diam., weakly glossy, dark to medium green, sometimes with pale yellow-green streaks; *spathe* (12–)15–28 cm long (averaging 20 cm long), 2–4 times as long as peduncle, acuminate at apex, convolute to about the middle in lower part, matte to weakly glossy outside, glossy within, solid medium green on both surfaces, gradually and weakly constricted somewhat above the middle; *spathe tube* 1.5–3.0 cm diam. when closed, 6.8–9 cm wide when flattened; constricted area 4.3–4.5 cm wide, flattened *spadix* (9–)16.5–25.5 cm long, about as long as or up to 3.0 cm shorter than the spathe; free portion 7.8–8.5 cm long; pistillate portion (4.8–)6–11.5 cm long; mostly sterile portion sparsely flowered to naked (rarely lacking, as in *Croat 70768*), 1.8–4.0 (–8.5) cm long with 0.6–1.5 cm totally bare, the uppermost portion with a few staminodia, sometimes with a few scattered staminodia throughout, the lower half sometimes with an occasional pistil and much reduced staminodia, rarely with the female flowers \pm equidistant and nearly contiguous with staminate part; fertile staminate portion (4–)5.5–10 cm long, 7–10 mm diam., slightly broader midway, weakly tapering to apex and base, bluntly pointed at apex; male flowers 5–6 per spiral, \pm rounded in outline, crenulate along margins, truncate at apex; sterile male flowers irregularly shaped, 1.8–2.5 mm diam.; pistillate portion of spadix to 11 cm long, 9–10 mm diam.; *female flowers* (15–)48–62, closely aggregated except in the upper 1.5 cm of spadix, 4–5 in the width of the spadix (uppermost pistil borne on an almost bare segment of the spadix); pistils pale cream-yellowish to pale yellow-green, smooth, 2.3–3.5 mm diam.; style (after stigma has fallen) sharply cupuliform, 1.5–1.7 mm diam., with a single central pore, stigmas yellow;

low; staminodia clavate, white, 2–3 mm long, mostly contiguous and sometimes fused at base; fruiting spathe pale yellow; berries red to red-orange, 5–8 mm diam.

Dieffenbachia tonduzii ranges from southeastern Nicaragua to the Pacific slope of Colombia (Antioquia, Chocó, Cauca, Valle) and Ecuador (Esmeraldas, Loja, and Los Ríos), from sea level to 1400 m, in tropical wet forest, premontane wet forest, and premontane rainforest in Central America and in tropical wet forest and pluvial forest and pluvial premontane forest and tropical wet forest transition to premontane in Colombia.

The species is characterized by its fully sheathed petioles, usually matte to weakly glossy, sometimes weakly velvety blades with cordulate bases and numerous, broadly spreading primary lateral veins. Because of the fully sheathed petioles it can be confused only with *D. horichii* Croat, sp. nov. ined., and *D. longispatha* var. *creberipistila* Croat, var. nov. ined. Both of the latter typically have much larger leaves that are not at all cordulate at the base (though they are rarely broadly and weakly subcordate). *Dieffenbachia tonduzii* is polymorphic with regard to leaf markings in the same way as *D. oerstedii* and is quite variable in all respects. It appears to hybridize with *D. oerstedii*.

Dieffenbachia tonduzii is similar to *D. daguensis* Engler, a Colombian species described from less than 200 m elevation on the Río Dagua in Valle Department. *Dieffenbachia daguensis* also has many rather close primary lateral veins and a fully sheathed petiole, but differs in having the staminate and pistillate sections of the spadix contiguous or nearly so. In addition, it differs in having much shorter petioles (described as being up to 5 cm long).

A South American species, *D. parlatorei* Linden & André, also sometimes has petioles fully sheathed but differs from *D. tonduzii* in having leaf blades usually broadest above the middle, semi-glossy on the lower surface, and the midrib often broadly rounded and spongy. It also has the primary lateral veins arising at a 40°–60° angle from the midrib (vs. often at more than 60° and sometimes up to 90° in *D. tonduzii*).

Croat 70900, from 250 m in Chocó Department, Colombia, appears to be *D. tonduzii*, but differs in several ways. It has leaves with the midrib flat-raised above with the margins undercut. It also has stems that appear scurfy (though weakly glossy if rubbed clean). Another difference is that the petiole sheath is more prominently free-ending and sub-

acute at the apex. In addition, the free portion of the petiole is broadly and sharply sulcate.

A collection from Bajo Calima (Valle Department, Colombia), *Croat 79768*, differs in having no sterile segment, with the staminate and pistillate flowers being closely contiguous. It otherwise resembles this species.

Dieffenbachia tonduzii is named in honor of Adolfo Tonduz (1862–1921), who made the first collection of the species in December 1898.

Paratypes. COSTA RICA. **Alajuela:** Cantón de Alajuela, Río Sarapiquí, junction of road to Virgen del Socorro, 10°15'30"N, 84°10'30"W, 700–830 m, *Grayum & Murakami 9939* (CR, MO), 830 m, *Croat 68336* (MO), *Stevens 13564* (MO), San Ramón–Bajo Rodríguez, vicinity of Km 19.5 NW of San Ramón, 10°11'N, 84°30'W, 925 m, *Croat 78838* (MO); San Ramón–Bajo Rodríguez, near Río Cataratas, 10°12'30"N, 84°32'W, 850 m, *Croat 68097* (MO); San Ramón–Bajo Rodríguez, 36–37 km NW of San Ramón, 10°15'N, 84°34'W, 500–515 m, *Croat 68196* (MO); San Ramón–Fortuna, km 26, N of Fortuna, 600 m, *D. Smith et al. 1059* (DUKE); San Ramón–San Lorenzo, 4–7 km N of Balsa, 10°13'N, 84°32'W, *Liesner & Judziewicz 14797* (MO); San Ramón–Fortuna, km 25 N of San Ramón, 600 m, *D. Smith et al. 1059* (MO); Naranjo–Aguas Zarcas, 8 km NE of Quesada, 600 m, Hwy. 15, *Croat 46945* (MO); Finca Los Ensayos, 11 km NW of Zarcero, 850 m, *Croat 43629* (MO); Volcán Arenal, trail above Río Agua Caliente, *Funk et al. 10626* (CR), *Funk et al. 10718* (CR); Cañas–Upala, 4 km NNE of Bijagua, vic. of Río Zapote, 400 m, *Croat 36260* (MO); 10 km N of Bijagua, 200 m, *Croat 36472* (MO); Bosque Eterno de Los Niños, Río Peñas Blancas valley, Laguna Poco Sol, *Haber & Zuchowski 11175* (MO). **Cartago:** Río Las Vueltas, Tucurrique, 635 m, *Tonduz 12874* (US); Camino Raiz de Hule, SE of Platanillo (Tsipirí), 1200–1400 m, *Croat 36727* (MO), *Croat 36747* (MO), *Croat 36821* (MO); Finca El Cedral, Orosi, Río Naranjo, 9°48'N, 83°52'W, 1400 m, *Lent 4042* (F, MO, NY, SEL); Monumento Nacional Guayabo, Turrialba, Santa Teresita, above Ríos Guayabo, Lajas & Torito, 9°57'N, 83°41'30"W, 700–1800 m, *Rivera 1718* (CR, K); Cañon de Río Orosi I, *Chacón et al. 1488* (CR, MO); Monumento Nacional Guayabo, Turrialba, 9°58'20"N, 83°41'45"W, *A. Pérez 1* (CR); 1.5 mi. E of Cachi, 10.2 mi. NE of junction of main road at Paraíso, *Croat 47088* (MO); Cartago Cantón, Río Reventazón at CATIE, Turrialba, 9°53'30"N, 83°39'W, 510–630 m, *Grayum et al. 9469* (CR, MO, NY), 630 m, *Lent 639* (F), 540 m, *Lent 694* (F); 3 km E of Turrialba, "Los Espaveles" nature trail, Río Reventazón, 9°54'N, 83°39'W, 525–600 m, *Liesner et al. 15330* (MO); Turrialba–Limón, 24 km NE of Turrialba, 1.5 km E of Tres Equis, 9°58'N, 83°34'W, 450–525 m, *Liesner et al. 15365* (MO); 12 air km S of Turrialba, 4 km SE of Pejibaye along Río Gato, 9°48'N, 83°42'W, 700 m, *Liesner 14394* (MO); Parque Nacional Tapantí, Sendero Oropéndola, 9°45'40"N, 83°47'27"W, 1100 m, *Nilsson et al. 632* (CR), 09°54'06"N, 83°47'27"W, 1200–1300 m, *Nilsson et al. 377* (CR). **Guanacaste:** Cordillera de Guanacaste, Rincon de la Vieja, NW of Quebrada Grande, 500 m, *Barringer et al. 4039* (F); El Arenal, 485–600 m, *Standley & Valerio 45206* (US), *Standley & Valerio 45262* (US). **Heredia:** Occidental Sendero, *Kress 84–1630* (SEL); 8 km E of San Ramón, 10°20'N, 84°04'W, *Loiselle 106* (MO); La Selva Reserve,

Croat 44317 (MO), *Folsom 10116* (DUKE), *Grayum 2780* (DUKE, F, MO), *Hammel 8874* (DUKE, F, MO), *Schatz & Grayum 706* (DUKE); near Puerto Viejo, along road to Río Sucio, 20 m, *Croat 35682* (MO), *Croat 35753* (F, MO); N slopes of Volcán Barba, between Río Peje & Río Guácimo, along Quebrada Cantarana, 300–400 m, *Grayum & Schatz 3174* (MO). **Limón:** Finca Castilla, 30 m, *Dodge & Goerger 9489* (MO); forests of Suerre and Dos Bocas, drainage of Río Parismina and Reventazón, sea level, *Shank & Molina 4288* (EAP); Finca Montecristo on Río Reventazón below Cairo, ca. 25 m, *Standley & Valerio 48999* (US); Río Segundo, Asunción 500–600 m, *Gomez et al. 23477* (MO); Reserva Indígena Talamanca Sukut, mouth of Río Sukut at Río Urén, 9°24'30"N, 82°58'15"W, *Hammel et al. 17548* (MO); Finca Anai, Quebrada Mata de Limón (Sixaola region), 9°35'N, 82°39'W, *Grayum & Schatz 5279* (CR, MO); Refugio Barra del Colorado, between Río Chiripocito and Río Sardina, 10°38'N, 83°45'W, 12 m; *Grayum 9804* (CR, MO); Parque Nacional Tortuguero, Lomas de Sierpe, 4 km NE of the P.N. over the Río Sierpe, 10°24'N, 83°33'W, 10°25'N, 83°34'W, 40–100 m, *R. Robles 2050* (CR, G, MO); Parque Tortuguero, Estación Agua Fria, *Robles 1142* (CR), *Robles 1158* (CR, MO); Tortuguero Cantón, Bribri–Suretka, 100–200 m, *Barringer et al. 3525*; between Bribri and Sixaola, NW of Paraiso, 20–70 m, 82°40'W, 9°39'N, *Barringer et al. 3479* (CR, F); Limón–Shiroles, along Río Sixaola, 0.9 mi. SW of Bambu, 6.5 mi. SW of Bribri, 50 m, *Croat 43298* (MO); Río Catarata between Bribri & Río Sixaola, 9°37'N, 82°49'W, 50–100 m, *Baker & Burger 90* (F, MO); ca. 10 km S of Punta Cahuita, ca. 3 mi. S of turnoff to Bribri, 70 m, *Croat 43201* (MO); 7 km SW of Bribri, 100–250 m, *Gomez et al. 20405* (B, MO); near Río Sixaola, ca. 1/2 mi. SW of Bambú, ca. 3 mi. NE of Bratsi, 15 m, *Croat 43266* (CR, MO); Guápiles, bosques de Toro Amarillo, 300 m, *León 720* (CR, F); Cantón Limón, headwaters of Quebrada Kakébeta below divide between Río Xikiari and Río Boyei, 9°47'00"N, 83°20'30"W, 900–1000 m, *Grayum 10858* (MO); Turrialba–Limón, 11 mi. S of Siquirres, 650 m, *Croat 43333* (MO). **San José:** Vazquez de Coronado, Braulio Carrillo National Park, San José to Siquirres Hwy., trail to Río Sucio, site of the Old Carrillo Station, 10°09'50"N, 83°57'10"W, 600–700 m, *Croat 78787* (MO); Puerto Viejo, near Río Sucio, 20 m, *Croat 35753* (MO); La Hondura, 1300–1700 m, *Standley 36314* (US). NICARAGUA. **Rivas:** Isla Ometepe, NW slopes of Volcán Maderas, 11°26'–27'N, 85°30'–31'W, 1000–1350 m, *Stevens 6511* (MO). **Zelaya:** road to Colonia Manantiales (Colonia Somoza), 6.3 km S of bridge at Colonia Yolaina, 11°36'–37'N, 84°22'W, 200–300 m, *Stevens 6420* (MO); Río Punta Gorda, Atlanta, mouth of Caño el Guineo, 11°33'N, 84°02'W, 10 m, *Moreno & Sandino 12855* (MO), *Sandino et al. 4875* (MO); Río Punta Gorda, Atlanta, 2 km al S de Carolina del Sur, 11°32'N, 84°01'W, 60 m, *Moreno & Sandino 12891* (MO); Río Punta Gorda, Atlanta, Caño Negro en la desembocadura del Río Chiquito, 11°35'N, 84°00'W, 30 m, *Moreno & Sandino 12917* (MO); Río Punta Gorda, Atlanta, desembocadura del Caño del Oro en el Río Chiquito, 11°36'N, 84°00'W, 10 m, *Moreno & Sandino 12955* (MO); Río Punta Gorda, Caño El Guineo, *Téllez et al. 4875* (CR, MEXU, MO). PANAMA. **Bocas del Toro:** along Continental Divide trail, 1.1 mi. from main highway, 8°44'N, 82°17'W, *Croat 60355* (MO); Continental Divide trail, 8°45'N, 82°15'W, *McPherson 9865* (MO); Almirante–Ojo de Agua, 3–6 mi. W of Almirante, 30–200 m, *Croat 38229* (F, MO); Valle del Silencio, along Río Changuinola, ca. 1 km above mouth of Río Teribe,

vicinity Teribe Indian population, 09°21'40"N, 82°31'40"W, < 100 m, *Croat & Zhu 76450* (MO); Chiriquí Grande–Fortuna, 1 mi. N of Continental Divide, 950 m, *Churchill & Churchill 6252* (MO); 1.6 mi. N of Continental Divide, 08°48'N, 82°13'W, 850 m, *Croat 74930* (MO); 13.2 mi. W of Chiriquí Grande, 8°45'N, 82°10'W, 310 m, *Croat & Grayum 60139* (B, MO, PMA); N of Fortuna Dam, 08°45'N, 82°15'W; 450–700 m, *McPherson 11129* (MO), *McPherson 7371* (MO); 6.6 mi. N of bridge over Fortuna Dam, 8°45'N, 82°18'W, 780 m, *Croat 66732* (MO); Fortuna–Chiriquí Grande, 8.1 km S of Punta Peña, 08°49'N, 82°13'W, *Croat 74952* (MO); 1.5 km W of Punta Peña, 8°50'N, 82°10'W, 80 m, *Croat & Grayum* (MO); Río Cricamola, between Finca St. Louis & Konkintoë, 10–15 m, 460 m, *Woodson et al. 1909* (F, MO); Almirante–Changuinola railroad, mile 7.5 S of Changuinola, < 100 m, *Croat & Porter 16249* (MO); Changuinola, forest near Luzon, *Kennedy 3253* (MO). **Chiriquí:** Gualaca–Fortuna, 7.9 mi. NE of Los Planes de Hornito, 8°44'N, 82°16'W, 1300 m, *Croat 49932* (MO); 7.7 mi. NW of Los Planes, 1400 m, *Croat 48778* (MO); 7.9 mi. NW of Los Planes, 8°44'N, 82°16'W, 1300 m, *Croat 49932* (MO); 10 mi. NW of Los Planes de Hornito, 8°45'N, 82°17'W, 1260 m, *Croat 50049* (MO); vic. Fortuna Dam, valley of Río Chiriquí, along aqueduct for IRHE facilities, 8°45'N, 82°18'W, 1200–1300 m, *Croat 66533* (B, DUKE, MO, NY, US); Fortuna Dam area, 5.3 mi. N of center of dam, 1.4 mi. W of main road near Continental Divide, 08°44'N, 82°17'W, *Croat & Zhu 76328* (MO); 4.5–5 km N of dam over Fortuna Lake, 8°43'N, 82°17'W, km 111, more than 500 m, *Gordon 339* (PMA). **Veraguas:** NW of Santa Fe, 11 km N of Escuela Agrícola Alto de Piedra, 450–500 m, *Croat 27490* (MO), *Cochrane et al. 3817* (F); 0.6 mi. N of Escuela Agrícola Alto Piedra, 730–735 m, *Croat & Folsom 33989* (MO), *Croat & Folsom 34042* (MO); 1 hour walk NW of Escuela Agrícola, 3000', *Antonio 2994* (MO); trail to summit of Cerro Tute, ca. 3 km above Escuela Agrícola Alto Piedra, 1050–1150 m, *Croat 48903* (MO), 2600–2800', *Sytsma & Antonio 3006* (MO); trail to summit of Cerro Tute, 8°33'N, 81°08'W, 800–950 m, *Croat 66993* (MO); mountains 3–5 mi. N of Santa Fe, 500–1000 m, *Gentry 3035* (MO); along 1st stream N of Escuela Agrícola Alto Piedra, 700 m, *Croat 49070* (MO). **COLOMBIA.** **Antioquia:** Murri–La Blanquita, Río Murri, 06°35'N, 76°50'W, *Gentry et al. 75903* (MO). **Cauca:** Coteje, Río Timbiquí, *Lehmann 8876* (K). **Chocó:** Quebrada Antón, 15 km W of Santa Cecilia, 6 km W of Chocó–Risaralda border, 20 km E of Playa del Oro, 05°20'30"N, 76°13'45"W, 240 m, *Croat 70900* (MO); Serranía de Baudó, Las Animas–Pato, Río Pato, ca. 4 km SW of Pato on property of Sr. Gutierrez, 5°30'N, 76°46'W, 150 m, *Croat 56112* (CHOCO, MO); Río Pichimá, Comunidad indígena Waunana, 4°25'N, 77°17'W, 100 m, (COL, MO); Quibdó–Medellín, at Km 185, 14 km E of Tutunendo, 5°44'N, 76°43'W, 300 m, *Croat 56282* (CHOCO, MO); km 208.5, 9 km W of Tutunendo, 5°39'N, 76°40'W, < 100 m, *Croat 56205* (COL, JAUM, MO); km 85 W of Bolívar, 350 m, *Croat 49310* (MO); San José del Palmar–Novita, vicinity of Santa Rosa at end of existing road, 4°57'N, 76°30'W, 350 m, *Croat 56625* (MO); Quibdó–Medellín, 25 mi. E of Quibdó, 200 m, *Croat 52300* (MO); ca. 2 km E of Playa de Oro, 5°20'N, 76°23'W, 200 m, *Croat 57427* (CHOCO, MO); Pueblo Rico (Risaralda) to Istmina (Chocó), 1 km W of Guarato and Río Guarato at Risaralda and Chocó border, 285 m, *Croat 70868* (CM, MO); E side of Serranía del Darién, approach from Acandí, 8°30'N, 77°20'W, 160 m, *Juncosa 619* (MO). **Valle:** Cordillera Oc-

cidental, western slopes, Río Digua, Piedra de Moler, 900–1180 m, *Cuatrecasas 15053* (US). **ECUADOR.** **Esmeraldas:** Cantón Eloy Alfaro, Comuna de Corriente Grande (Río Chimbagal, tributary of Río Cayapas), 00°41'N, 78°50'W, 150–200 m, *Yáñez et al. 1387* (MO); Reserva Ecológica Cotacachi-Cayapas, Charco Vicente, Río San Miguel, 00°43'N, 78°53'W, 150 m, *Palacios & Tirado 11287* (MO, QCNE); Lita–Carondolet Road, km 16, 800 m, *Schwerdtfeger 021422* (MO); Cantón Quinindé, NE of Las Golondrinas, Sitio La Bella Jungla, Cooperativa Unidos Venceremos, 00°20'N, 79°12'W, 300 m, *Palacios 11452* (MO); Quinindé, Bilsa Biological Reserve, Montañas de Mache, 35 km W of Santa Quinindé, 5 km W of Santa Isabela, 0°21'N, 79°44'W, 400–600 m, *Pitman & Bass 995* (MO); Fila de Bilsa, 7 km E of San José de Bilsa, 80 km due SW of Esmeraldas, 12 km SE of El Salto on Atacames–Muisne Road, 00°37'N, 79°51'W, 280 m, *Gentry et al. 72955* (MO). **Los Ríos:** Casería de Bimbo, 10.5 km N of Patricia Pilar, 0°35'N, 79°12'30"W, 550–575 m, *Croat 57000* (CM, MO); Centinela, Montañas de Ila, 13 km E of Patricia Pilar, 00°26'S, 79°30'W, 600 m, *Hammel & Trainer 15836* (MO); Centinela, 12 km E of Patricia Pilar, 650 m, *Gentry et al. 26705* (MO); El Centinela, 550–600 m, *Gentry et al. 24700* (MO).

Rhodospatha pellucida Croat & Grayum, sp. nov.

TYPE: Panama. Bocas del Toro: along road between Chiriquí Grande and Fortuna, 7.7 mi. W of Chiriquí Grande, 1.5 mi. W of Punta Peña, 80 m, 8°50'N, 82°10'W, 19 Mar. 1985, *Croat & Grayum 60106* (holotype, MO-3123550; isotypes, B, K, PMA, US).

Planta epiphytica; internodia brevia, 1–2 cm diam.; petiolus 8.5–23 cm longus, vaginatus ubique; geniculum V-sulcatum; lamina oblongo-elliptica, inaequilatera, 21–41 cm longa, 7.2–14.5 cm lata; nervis primariis lateralibus 21–33 utroque.

Appressed-climbing epiphyte; stems to 2–2.5 m above ground, the flowering branches somewhat divergent; internodes shorter than broad, 1–2 cm diam. near apex (drying frequently less than 1 cm diam.) and often flattened, glossy, medium to dark green, tapered below, drying brown, matte, densely and finely granular. *Leaves* distichous, somewhat clustered toward the stem apex, spreading or ascending; petioles medium green, 8.5–23 cm long, ca. 5 mm diam. below the geniculum, sheathed throughout their length, drying matte, yellowish brown; sheath erect, persistent intact with the margin sometimes drying darker brown; geniculum C-shaped, V-sulcate adaxially, 1–1.5 cm long, somewhat shrunken on drying; blades reflexed from petiole on upper leaves, directed in line with the petioles on the lower leaves, moderately coriaceous, conspicuously bicolorous, oblong-elliptic, inequilateral, tapering ± equally toward both ends, slightly inequilateral and gradually acuminate to obtuse and abruptly acuminate at apex, acute to attenuate at base, broadest at the middle or just above the

middle, 21–41 × 7.2–14.5 cm, 2.5–4.5 times longer than wide, 1.6–3.4 times longer than petioles, dark green and glossy above, drying gray-green to olive-green or yellowish brown; matte to weakly glossy, yellow-green to silvery-green and paler below, drying yellow-brown to yellow-green; midrib paler than surface, obtusely V-sulcate above, thicker than broad and ± concolorous with surface below; primary lateral veins 21–33 pairs, somewhat to deeply impressed above, darker than surface below and convex, but drying only weakly raised to flat, 5–17 mm apart, departing from midrib at 30–47°, moderately arcuate to the margin, sometimes prominently downturned just before merging with the midrib; interprimary veins 1 alternating between adjacent primary lateral veins, much less conspicuous than the primary lateral veins; both the primary lateral and interprimary and sometimes the minor veins margined with thick black lines on drying (those of the interprimary and minor veins usually intermittent and appearing as rows of pellucid dots and streaks on living plants and appearing above as weak dark green bumps) and also with a sparse arrangement of pale raphide cells aligned with the dark black lines; minor veins 1–3 between alternate primary and interprimary veins, usually very weak, branched toward the margin; cross veins usually inconspicuous, often branched, mostly extending throughout the surface; surface minutely dark-granular, often sparsely covered with pale raphide cells on lower surface. Inflorescences 1 or 2, from the upper leaf axils; peduncles arching, (5–)12–28 cm × 6–8 mm diam., usually longer than petioles (up to 13 cm longer), sometimes equaling petioles or rarely somewhat shorter than petioles, drying light brown; spathe coriaceous, acuminate at apex and up to 1.4 cm diam. when furled, hemispherical when open, 8–15 cm long, to ca. 5 cm wide, 5–13 cm diam. when opened flat, the veins impressed, white to greenish white, matte outside, glossy and white inside, dark brown on drying, often promptly deciduous, sometimes persistent; spadix cylindroid, weakly tapered toward both ends, white to cream at anthesis, soon becoming gray or green or grayish green after anthesis, 6.3–18.5 cm long, drying 6–15 mm diam., sometimes shorter but usually 1–3 cm longer than the spathe, stipitate 4–9 mm on the back side, held at ca. 35° angle to the peduncle; flowers 4-sided, 2–2.8 mm in both directions, 12–13 visible in the principal spiral, 8–9 visible in the alternate spiral; *pistils* mostly 4-sided, sometimes irregularly 5–6-sided, 1.4–2 mm wide, the style truncate, gray, matte and minutely granular, sometimes smooth, brown; stigma broadly elliptic, slit-like, 0.9–1.1 ×

0.5–0.8 mm, depressed medially, drying black with a pale ring-like base; stamens included; filaments densely embedded with short, pale raphide cells; anthers 1.2 mm long, 0.7 mm wide, the thecae oblong, connivent; pollen white. Infructescence to 15 cm long, to 2 cm diam.; seeds reniform, light brown, glossy, 0.8–1 mm long, the outer margin deeply and sharply sulcate.

Rhodospatha pellucida ranges from Nicaragua to Panama on the Atlantic slope and into Colombia and Ecuador on the Pacific slope, from sea level to 360 m in premontane moist forest and wetter parts of tropical moist forest life zones.

This species is characterized by its relatively small size, with stems less than 2 cm in diameter and leaf blades usually less than 12 cm wide. The leaf blades dry yellowish brown to yellowish green and have the primary lateral veins as well as many interprimary veins and minor veins bordered with continuous or intermittent dark black lines (appearing as irregular rows of pellucid-punctate markings on the lower surface and as minute bumps on the upper surface on fresh leaves). Also characteristic is the dark reddish granular or brownish granular lower blade surface on magnification.

Rhodospatha pellucida is perhaps most closely related to *R. killipii* Croat ined., an undescribed species restricted to the Amazon basin. These species have leaves of similar color and shape with a scattering of pale raphide cells visible on the lower surface. The latter differs in having blades that dry thicker, with minute, close ridges on the lower surface, and lacking the intermittent pellucid punctations that appear as darkened dots and dashes along the interprimary veins on the lower surface of dried leaves as found in *R. pellucida*.

Rhodospatha pellucida is also similar to *R. forgetii* N. E. Brown, a species apparently also from Costa Rica. *Rhodospatha forgetii* differs in having thicker blades that are not at all dark granular-punctate on the lower surface, and have more prominently raised primary lateral veins without the dark margins or the intermittent dark dots and streaks along the interprimary veins and the minor veins.

Paratypes. COLOMBIA. **Chocó:** km 185, 14 km E of Tutunendo, 5°44'N, 76°43'W, *Croat 56285* (CHOCO, JAUM, MO); near Río Iró, ca. 10 km S of Istmina, 5°14'30"N, 76°41'00"W, 50 m, *Croat 57389* (MO). **Nariño:** Tumaco, Corr. Llorente, Vereda el Carmen, *Díaz et al. 1104* (COL). COSTA RICA. **Alajuela:** 300 m, Ciudad Quesada to Los Chiles, 9 km N of Ciudad Quesada, Río Peje, 10°22'N, 84°28'W, *Hammel et al. 15306* (CR, MO); San Carlos, 3 km S of Boca de Arenal, Río San Carlos,

Hacienda Boca Arenal, 100 m, 10°30'N, 84°30'W, *Hammel & de Nevers 15325* (MO); 22 km NE of Quesada by air, 4 km W of Muelle San Carlos, 10°28'N, 84°30'W, *Liesner 14139* (MO), *Liesner 14157* (MO); 2 km N of Santa Rosa, 15 km N of Boca Arenal on Quesada–Muelle San Carlos–Los Chiles road, 100 m, 10°38'N, 84°31'W, *Liesner et al. 15033* (CR, MO); 15 km WNW of Quesada by air, 1 km W of Jabillos, 150–200 m, 10°23'N, 84°33'W, *Liesner et al. 15149* (MO); along road from Cañas to Upala, 13.8 km N of Bijagua, 100–150 m, *Croat 36426* (MO); new Volcán Arenal, *Taylor & Taylor 11609* (MO). **Guanacaste:** Lake Arenal, from Río Chiquito to Río Caño Negro, 10°27'N, 84°50'W, 550–850 m, *Hammel et al. 15155* (MO). **Heredia:** La Selva Reserve, at confluence of Río Sarapiquí and Río Puerto Viejo, 10°26'N, 84°01'W, 50–100 m, *Grayum 7668* (MO), *Hammel 9517* (MO), *Croat 78734* (INB, MO), *Grayum & Sleeper 2896* (DUKE, MO); Puerto Viejo, 50 m, *Burger & Stolze 5836* (CR, F, US), *Croat 35713* (MO). **Limón:** in Tropical wet forest, and Premontane wet forest, Cordillera de Talamanca along Río Barbilla, from jct. with Río Dantas to ca. 1 km downstream, 10°01'N, 83°25'W, 100 m, *Grayum et al. 8966* (MO); between Quebrada Mata de Limón & Quebrada Tigre, Finca Anai, (Sixaola region), 09°34'N, 82°40'W, 25–30 m, *Grayum et al. 4450* (CR, MO); trail from Mata de Limón to Finca Anai, 09°33'N, 82°38'W, 15 m, *Grayum & Schatz 5260* (CR, MO); Río Frío to Limón, vic. Río Blanco, W of Guápiles, Quebrada Danta, 3 mi. S of main highway along old railroad bed, 10°12'N, 83°49'W, 360 m, *Croat 68424* (MO); Ref. Nac. Barra del Colorado, 10–

15 m, *Grayum 9845* (CR, MO); hills 2 airline km SSE of Islas Buena Vista in the Río Colorado, 14 airline km SW of Barra del Colorado, 10°40'N 83°40'W, 10–20 m, *Davidse & Herrera 31091* (MO); Cerro Coronel, E of Laguna Danto, 10°41'N, 83°38'W, elev. 20–170 m, *Stevens 24558* (MO); Hacienda Tapezco, *Davidson & Donahue 8499* (LAM), *Davidson & Donahue 8759* (LAM), *Davidson & Donahue 8979* (LAM, MO). **ECUADOR. Esmeraldas:** 8.6 km beyond bridge over Río Esmeraldas (near San Mateo, on road to Esmeraldas airport), ca. 6.6 km beyond Universidad Tecnológica Luis Vargas Torres–Estación Experimental Mútile, along Río Mútile (tributary of Río Esmeraldas), 0°52'N, 79°33'W, 80 m, *Croat 55628* (QCA, MO); Esmeraldas–Muisne, 50 km SW of Atacames, *Balslev & Steere 3104* (QCA). **NICARAGUA. Río San Juan:** La Lupe, ca. 25 km ENE of Boca de Sábalo, *Salick & Stijfhoorn 8269-b* (MO). **PANAMA. Bocas del Toro:** Fortuna–Chiriquí Grande, on side road 10 mi. from continental divide, on trail off pipeline trace, 8°55'N, 82°10'W, 300 m, *McPherson 12566* (MO, PMA); Fowler hill above RR station at Milla 7.5, *Croat 16402* (MO). **Colón:** Sabanitas–Portobello, Río Piedras Lumber Road, departing main highway 6.7 mi. E of Sabanitas, 3.9 mi. up logging road in direction of Santa Rita Ridge, 09°22'30"N, 79°41'30"W, 250 m, *Croat 75156* (CM, K, MO). **San Blas:** El Llano–Cartí road, Km 26.5, 9°19'N, 78°55'W, 200 m, *de Nevers et al. 7846* (MO).

Acknowledgment. Research for this article was supported in part by NSF grant DEB9306891.